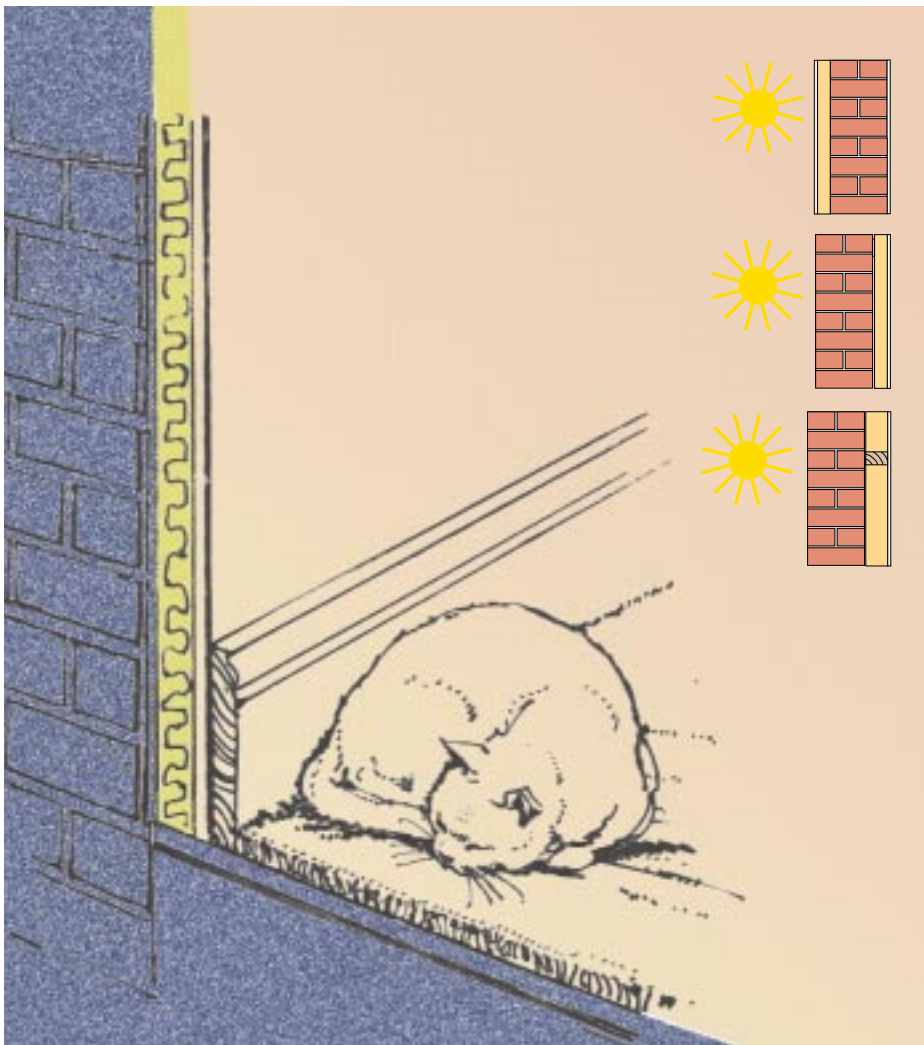


Refurbishment site guidance for solid-walled houses – walls



- What energy savings to aim for
- Key points to consider
- Energy savings and SAP ratings
- Environmental considerations



ENERGY EFFICIENCY

BEST PRACTICE
PROGRAMME

ENVIRONMENTAL CONSIDERATIONS AND FURTHER INFORMATION

Of the insulation products mentioned in this Guide, mineral wool is generally regarded as the most 'environmentally friendly' and extruded polystyrene the least environmentally friendly. However, for all insulation materials, the reduction in the emission of greenhouse gases as a result of the energy saved in the lifetime of the insulation will far exceed the greenhouse gases released as a result of their manufacture.

The manufacture of mineral wool is less energy intensive than foamed plastic insulation and does not involve the use of CFCs or HCFCs. All foamed plastic insulants are available 'CFC free' and some products are also available 'HCFC free'.

For improvement work to have the minimum environmental impact, there are a number of renewable insulation products that can be used as an alternative to the more widely used insulation products mentioned in the Guide. Recycled cellulose fibre, sheep's wool, cork and flax can all be used in place of mineral wool quilt and have similar insulation properties, but are only available from a limited range of specialist suppliers.

There are, however, no direct renewable alternatives to the high-performance insulation boards (urethane foam, phenolic foam and extruded polystyrene). Of these insulants, phenolic foam is the least environmentally harmful. As an alternative, standard expanded polystyrene (EPS) could be used. This has less of an environmental impact than other foamed plastic insulants, but EPS boards need to be about 50% thicker than the high-performance insulation boards mentioned above to achieve the same level of insulation.

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Good Practice Guides

- 155 Energy efficient refurbishment of existing housing
- 293 External wall insulation for dwellings – a guide for designers and building professionals (in preparation by BRECSU)

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PO Box 12, Haselmere, Surrey GU27 3AH
Tel 01428 654011

British Board of Agrément

PO Box 195, Bucknalls Lane, Garston
Watford WD2 7NG. Tel 01923 662133

Wimlas Ltd

St Peter's House, 6-8 High Street, Iver
Bucks SL0 9NG. Tel 01753 737744

This Guide is based on material drafted by NBA Tectonics Limited under contract to BRECSU for the Energy Efficiency Best Practice programme.

Energy Efficiency Best Practice in Housing

Tel: 0845 120 7799
www.est.org.uk/bestpractice

Energy Efficiency Best Practice in Housing is managed by the Energy Saving Trust on behalf of the Government. The technical information was produced by BRE.

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INTRODUCTION

This is one of a series of Guides aimed at architects, builders, local authorities and housing associations. It provides advice on which insulation methods are most appropriate for walls and the thickness of insulation needed to achieve a good level of energy efficiency.

Other Guides in this series are:

GPG 294 Refurbishment site guidance for solid-walled houses – ground floors

GPG 295 Refurbishment site guidance for solid-walled houses – windows and doors

GPG 296 Refurbishment site guidance for solid-walled houses – roofs

The Guide lists the technical points to be aware of, the most suitable insulation materials and typical costs.

TERMS USED IN THIS GUIDE

U-value. The measurement used to express the rate of heat loss through a wall, roof, window, etc. A roof with a U-value of 1 W/m²K would lose 1 Watt of energy per hour through a 1 m² area of roof for every 1°C difference in temperature between the inside and outside. The lower the U-value, the better insulated the construction. The current Building Regulations require a minimum U-value of 0.45 W/m²K for external walls.

Vapour control layer. An impervious membrane, usually a polythene sheet or aluminium foil facing. It is placed on the warm side of insulation to prevent water vapour generated in the house from entering and condensing on the cold parts of the construction.

SAP RATINGS

The Standard Assessment Procedure (SAP) is an energy rating which estimates the space and water heating costs (based on the size of the property and its heating and hot water system) and converts it into a rating on a scale from 1 to 100. The higher the number, the lower the energy consumption.

SAP rating		Typical annual heating and hot water costs
39	typical mid-terrace house basic gas central heating	£560
53	walls insulated to U-value of 0.45	£425
70	fully insulated and double glazed	£300
90	fully insulated, double glazed and with gas condensing boiler	£200

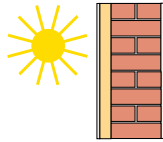
The SAP rating can be used to compare the relative benefits of different energy efficiency measures.

Insulating a solid 225 mm brick wall to a U-value of 0.45 would increase the SAP rating by about 14 points for a mid-terrace house and about 20 points for an end of terrace or semi-detached house*. For comparison, the effect of insulating other parts of the house are shown below.

Element	U-value (W/m ² K)	Increase in SAP rating
Roof	0.2	10
Ground floor	0.3	2-3
Windows	3.0	5

Note 1: These figures assume a typical solid-walled, mid-terrace, two-storey house with a basic gas central heating system.

* 'The Government's Standard Assessment Procedure for the energy rating of dwellings. 1998 edition' (available from BRECSU Enquiries Bureau – contact details are on the back page).



SOLID MASONRY WALL – EXTERNAL INSULATION

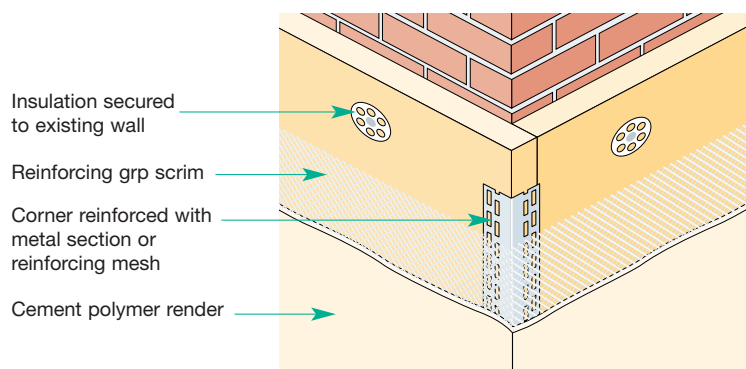
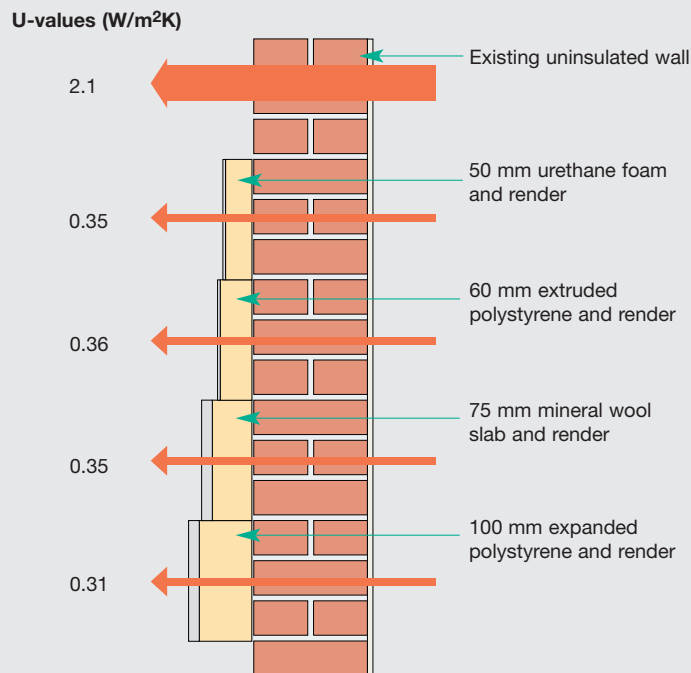
External insulation systems comprise an insulation layer fixed to the existing wall and a protective render or cladding. Solid-wall insulation is expensive and is generally only worth considering if the walls suffer from damp penetration or are in a poor state of repair.

WHAT TO AIM FOR

The high cost of external wall insulation makes it worthwhile to aim for a U-value of 0.35 W/m²K or less.

KEY POINTS

- Unless the existing house is rendered, adding external insulation will radically change the appearance of the property and may need planning permission.
- The work must be done by a specialist installer. Select a system that has been approved by the British Board of Agrément or Wimlas – the Insulated Render and Cladding Association has a list of proven systems and approved installers.
- There are many render systems on the market. Most consist of either a thick sand/cement render applied over a wire mesh, or a thinner, lighter polymer cement render applied over a grp scrim.
- The extra thickness of the external insulation system means care is needed at window sills, rainwater downpipes and where the wall meets the roof and projections such as porches and conservatories. Discuss with the specialist installer how these junctions will be treated.
- Consider the future maintenance requirements when selecting a rendered finish. A 'pebbledash' finish should need less maintenance than a painted render finish. Light-coloured finishes that reflect the heat are less likely to suffer from cracking.
- The render finish is more easily damaged than a solid brick wall and so external insulation is not recommended for walls in vulnerable locations, such as adjoining a public footpath.



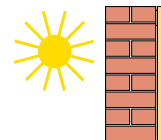
MATERIALS

- All materials are supplied by the specialist installer. Most installers are trained in the use of one insulation system, which uses a particular insulation product.

COSTS

- Costs are high, typically ranging from £50–100/m². The scaffolding costs are a high proportion of the overall cost. If scaffolding is needed to carry out extensive repair to the existing brickwork or render, then the additional cost of external insulation is more cost-effective.

SOLID MASONRY WALL – INTERNAL INSULATION WITH THERMAL BOARDS



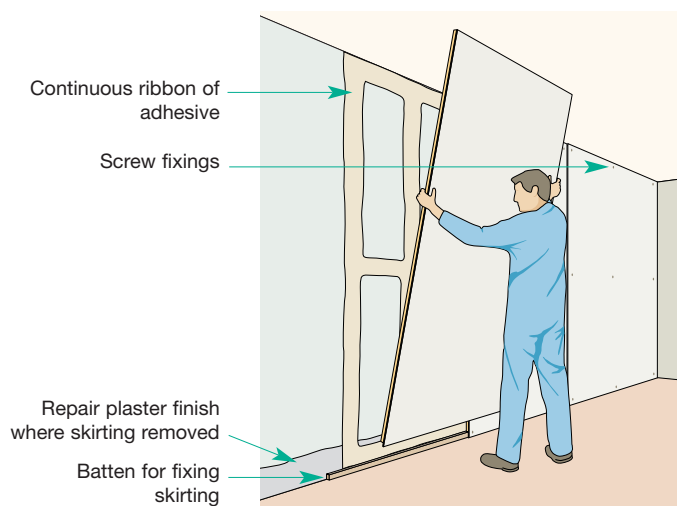
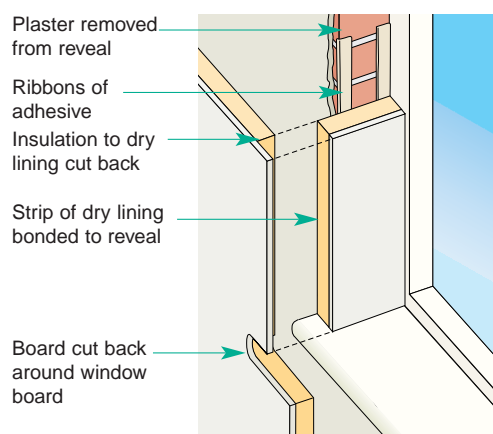
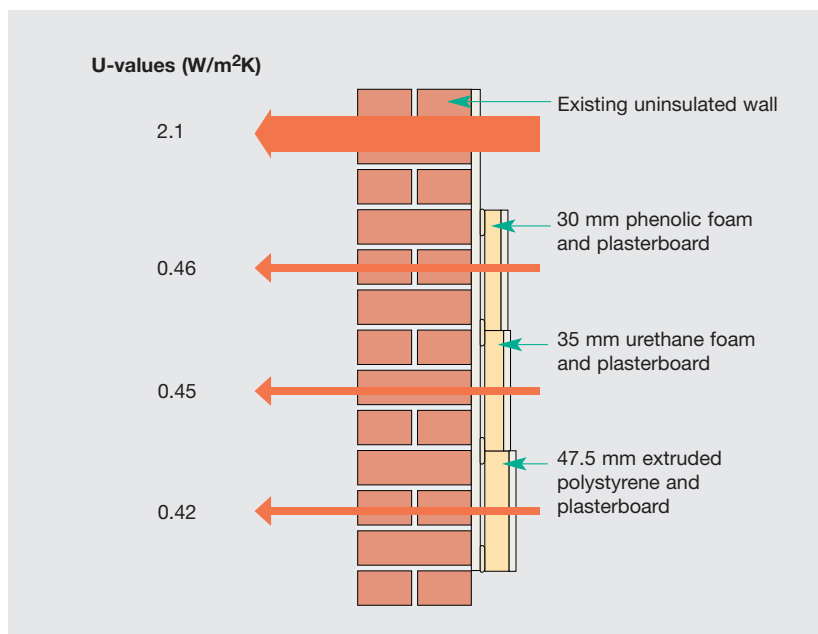
Internal wall insulation is disruptive, but presents an ideal opportunity if the existing plaster finish is being renewed.

WHAT TO AIM FOR

For external walls, aim for U-value of 0.45 W/m²K.

KEY POINTS

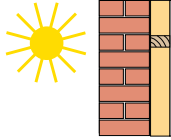
- Use a thermal board with a built-in 'vapour check' to stop moist air from the house condensing on the cold brick behind the insulation.
- Where existing plaster is removed and the brick is uneven, level the wall with render to provide an even surface before fixing the thermal boards.
- Use continuous ribbons of plaster adhesive at the wall perimeter and around all openings and socket outlets to prevent cold air behind the insulation leaking into the house.
- Mechanical fixings should be used to hold the plasterboard in place in case of fire.
- Return the insulation into window reveals to prevent condensation forming on the cold, uninsulated surfaces, using thinner insulation if necessary.
- Consider where heavy fixtures such as kitchen units, radiators and wash basins are to be located and provide timber fixing battens within the insulation layer.

**MATERIALS**

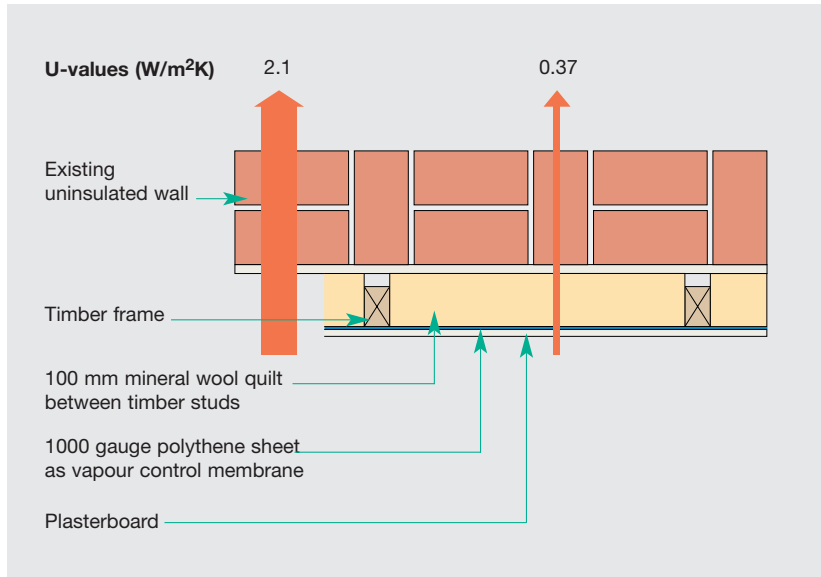
- Thermal boards are available with a range of insulation backings, eg expanded polystyrene, extruded polystyrene, urethane and other high-performance insulating foams. Each product is available in a range of thicknesses.
- Most merchants stock a limited range of products and you may need to order the exact thickness and insulation material you require.

COSTS

- Allow for builders' costs of about £25–30/m² depending on thickness, insulation material, fixing method and the amount of preparation work needed.



SOLID MASONRY WALL – INTERNAL INSULATION WITH TIMBER BATTENS



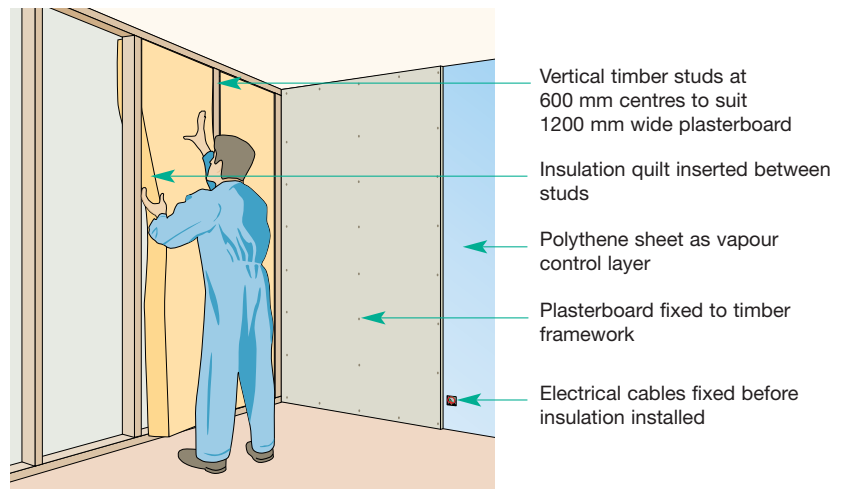
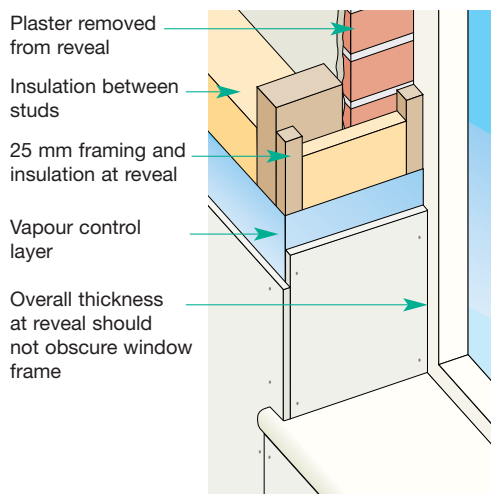
Battening out the wall is a good solution where the wall is bowed or uneven and space is not at a premium.

WHAT TO AIM FOR

For external walls, aim for a U-value of $0.45 \text{ W/m}^2\text{K}$.

KEY POINTS

- Timber framing should be preservative treated.
- Place 1000 gauge polythene sheet between the insulation and plasterboard as a vapour control layer to stop moist air from the house condensing on the cold brick behind the insulation.
- Return 25 mm thick insulation into the window reveals to prevent condensation forming on the cold, uninsulated surfaces.
- Consider where heavy fixtures such as kitchen units, radiators and wash basins are to be located and provide timber framing as appropriate.



MATERIALS

- 100 mm thick rolls of mineral wool loft insulation may be used between the timber uprights. These are readily available 400 and 600 mm wide from builders' merchants.

COSTS

- Allow builders' costs of about $\text{£}30/\text{m}^2$. The higher labour content means that insulating between battens is more expensive than using thermal boards.
- The DIY cost of materials is about $\text{£}4.50\text{--}\text{£}6.00/\text{m}^2$.

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